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Technical Wheat blends

Blending success

Growing blends of wheat varieties is becoming more popular. But how have they performed on farm and what makes a good blend? CPM investigates.

By Mike Abram

Around six seasons ago, Essex grower Simon Cowell started growing a blend of wheat varieties, and in every season that blend has outperformed any single variety he has trialled against it. Except one, he says, and that was in the harvest he's just finished.

“This harvest has thrown up some strange results. I did a variety trial for the Organic Research Centre comparing its Wakelyn's YQ population with KWS Siskin and KWS Saki, and also my blend. The Siskin and Saki both yielded quite a bit more than my blend this time, which is unusual in my trials, where the blend usually yields the most.”

The original blend was made up of 25% of the four varieties: Conqueror, JB Diego, Panorama and KWS Gator — all hard feed wheats and chosen because they were unrelated to each other.

But after home-saving seed each season, the mix has changed with the variety that has performed best over the years, Conqueror, slowly becoming more dominant.

“DNA testing is showing that is around 63% Conqueror now, so it has evolved away from being a diverse mix.”

And that's starting to be a problem because Conqueror is breaking down to yellow rust, which means it's not helping achieve one of his primary motivations for growing a diverse blend — cutting fungicide inputs.

During the lifetime of the blend, Simon has been able to successfully reduce fungicides by routinely only applying a flag leaf spray, and sometimes an ear spray if needed.

Yellow rust

This season, the wet May meant all his wheat had both T2 and T3 sprays. But in another trial, he also applied a T1 on some tramlines which gave a yield advantage by holding yellow rust back a bit better, he thinks.

“The problem is my blend is not diverse enough now and is susceptible to yellow rust. With four varieties at 25% each, the theory is the disease can't spread through so quickly but now one is nearly 65% the whole theory is lost.

“I'm going to drill it again, but I'm going to dilute the blend by mixing in some KWS Extase and Theodore so it will be a six-way mix.”

Fellow experienced blend grower, Angus Gowthorpe from Hollicarrs, 10 miles south of York, is also planning a new blend for the coming season after starting to see a bit more yellow rust and septoria in his four-way — RGT Gravity, KWS Kerrin, Shabras and KWS Crispin — blend last season.

“It's not just what we are finding in the field but also we can see the disease resistance is starting to slip in the (AHDB) RL trials.”

Like Simon, cutting input costs — especially fungicides — is his main reason for growing a blend, although he says he also gets an uplift in yield. “Two seasons ago we didn't use any synthetic fungicide, while last season it had just 1.0 l/ha of tebuconazole at T3 as yellow rust came racing in and we couldn't control it using biology.”

Using the blends is just one part of his overall strategy to reduce synthetic inputs including nitrogen, alongside direct drilling, biological product Consortium (containing plant growth promoting rhizobacteria), and greater use of micronutrition.

The new blend will be eight varieties strong. “By having more varieties, you reduce the pressure on each and if one does go, it lessens the yield impact.”

His key selection criteria are — as much variation in parentage as possible, good untreated yields and in-bred disease resistance. “It's a struggle to find diverse ▶



Simon Cowell says that his four-way blend has always outyielded single varieties on his farm until this year, when a shift in its diversity has allowed yellow rust in.

How do blends reduce disease pressure?

French research led by Julie Borg of INRA, published in 2018, suggested five different mechanisms which explain how variety mixtures could increase control of airborne diseases or yields:

- Dilution – lower density of susceptible plants results in lower probability of spores finding a susceptible host
- Barrier – resistant plants among susceptible ones creates a physical barrier reducing the spread of the pathogen
- Induced resistance – the genetic diversity of varieties leads to more diverse pathogen populations with both virulent and avirulent spores. Stimulation of plant defences by avirulent spores prevents or reduces infection by virulent spores
- Disruptive selection – in single variety fields, the most effective pathogen strains are quickly selected, while in mixtures the selection pressures are more diverse and reduce the speed of adaptation of pathogens to the crop species
- Compensation – in a mix the individuals of the

most susceptible varieties have poor growth or yield, but this can be compensated by individuals of less susceptible varieties better using available resources

The literature review suggested that variety mixtures yielded higher than the mean of the component varieties, a finding duplicated in practice by Danish researcher Dr Rose Kristoffersen during her PhD studies.

In Rose's research, which analysed 19 years of the Danish equivalent to RL trials, the four-way blend grown as a reference reduced septoria severity by 10%, with a 1.4% increase in yield. In untreated trials the advantages increased to a 17% reduction in septoria and 2.4% yield increase.

Further trials work showed a greater reduction in septoria in blends with more varieties, and where both susceptible and resistant varieties were grown. Blends with just resistant varieties tended to show lower reductions in septoria, although disease levels were also lower.

Of 200 mixture combinations trialed in the field work, 84% reduced septoria severity, while there were increased yields in 72% of the



Danish research explains how blends can reduce the incidence of septoria compared with where single varieties are grown.

184 taken to yield.

She also looked at whether blends could reduce the number of fungicide sprays required with less conclusive results. Around a third of the trials suggested it would be possible to reduce fungicide applications, a third where it wouldn't make sense to do so, and a third where it wasn't statistically significant either way.

But growing a blend of resistant varieties would make it less likely that you would be able to reduce fungicide inputs compared with standard practice when growing the individual resistant varieties, according to Rose's conclusions.

▶ parentage, but the tool AHDB (see below) is developing is helping to make that more visible.”

That's also a challenge for North Oxfordshire grower Ben Adams, who

tested a four-way milling blend containing Crusoe, Skyfall, RGT Illustrious and Cordiale last season.

“We were primarily motivated to look for some disease resistance and increased

diversity to reduce our fungicide spend — mainly for yellow rust and septoria.”

The farm grew 15ha and compared it with Skyfall in the same field. “It was clear that Skyfall was harbouring yellow rust, as lots of

New AHDB tool to help select variety blends

Aware that more growers were interested in growing wheat variety blends, AHDB data analyst Bastiaan Brak set about creating a tool that would help select three- or four-way blends.

“After gathering feedback from growers, it was clear they wanted to know two things about a blend — how the individual components perform on specific criteria, such as septoria resistance or untreated yield, and how related are the varieties they are considering for the blend,” explains Bastiaan.

“That led me to calculate two scores for every blend — one is the average of Recommended List data for selected characteristics, and the other is a score that effectively represents how related the parents are.”

Filters can be selected which allow growers to select only varieties with specific end-use markets or maturity, fix the number of varieties with orange wheat blossom midge resistance, or select specific varieties to be included or not included in the blend.

For the first metric, up to eight characteristics can be used and compared — including varietal resistance to septoria and both rust diseases,

quality criteria and lodging. All have been weighted to a 1-9 scale and a score calculated for each blend based on the selected characteristics.

“There are some important caveats around these scores. One major limitation is the data is from single varieties grown individually in trial plots, and therefore it's impossible for the mechanisms occurring in blends to be factored in, so the score is only indicative.

“But the purpose of the tool is to give some guidance for further on-farm tests. While you can rank the blends, it's not a predictor of how blends will perform on farm.”

The parental diversity metric, which for many growers is the key criteria when putting together a blend, is the mean of the parental diversity score for every variety pair in the blend, so a three-way blend has three varietal comparisons while there are six for a four-way blend. For a given variety pair, the score is 0 if four generations of parents are identical and 1 if they are all different, he explains.

“Again, there's a caveat that even if varieties have completely different parentage, it doesn't 100% guarantee the disease resistance genetics



A new tool is being developed by AHDB's Bastiaan Brak, which looks at the parentage of varieties to help growers choose the most suitable to blend together.

are also different. They could be, but also may not be, but it's the best readily available indicator we have.”

Last tweaks on the tool are currently being made, but Bastiaan hopes that will be available for growers to use by next January at the latest via the AHDB website, and perhaps much sooner.



Reducing fungicide inputs is the primary motivation for growing blends.

farmers found last season, and you could see the difference between the two.

"The blend still had yellow rust, especially on the Skyfall plants, but it wasn't as prevalent."

As it was a trial, he didn't treat the blend any differently to the Skyfall but he's hoping to be able to reduce fungicide applications by one spray and use cheaper chemistry in future, compared with the four-spray programme he now has to use on Skyfall.

The difference in yellow rust was also evident at harvest, when there was



Trials at Ben Adams' farm show yellow rust development is much slower in a blend containing Skyfall (shown on the left) than where Skyfall is grown on its own.

Did you know?

In a CPM survey of 20 growers, 60% of respondents who were already growing blends or intended to start, said diverse parentage was the most important factor when designing a blend, with yield and septoria resistance the next most important. BYDV or midge resistance were deemed least important traits from the eight suggested.

The number one motivation for blends was a desire to reduce inputs, with increasing the resilience of wheat growing on the farm second. Reducing seed costs wasn't a factor, although many of the growers use home-save seed.

approximately a 0.7-0.8 t/ha benefit for the blend shown by the combine yield monitor.

"One other difference we noticed was that it was harder to get a sample from the blend — it didn't go through the combine as well — maybe due to different maturities," he suggests.

The result has encouraged him to increase the area of the blend considerably this season, but with a lower percentage of Skyfall. "We're going to add in 30% Extase and 30% Crusoe, so the mix will be 40% Crusoe, 30% Extase and 10% of the other three.

"We want the disease resistance from the Extase and we're adding a bit more of the Crusoe as it's the highest protein variety and should make sure we still hit those milling specifications."

Protein levels last season for the blend



Angus Gowthorpe is moving to an eight-way blend because he believes it will reduce the pressure on each and if one breaks down, there'll be less impact on yield.

were 12.4%, compared with 12.5% for Cordiale and Skyfall's 12.0%, he says.

"We haven't sold the blend yet but can't foresee any problems." ■



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